

Syllogistic Validity and Existential Assumptions: A Modern Formal and Computational Reconstruction

Karol Wapniarski

The aim of this dissertation is to comprehensively describe the issue of the non-emptiness of terms in traditional logic (syllogistic) and its connections with modern formal logic, with a special focus on how the additional existential assumptions influence the validity of syllogistic proofs. It starts with a general overview of syllogistic and then proceeds to part one. The first part of the work is then concerned with, first, a thorough description of the historical views on syllogistic proofs, presented through an analysis of the development of the famous *Barbara, Celarent...* syllogistic mnemonic device; second, an analysis and study of historical sources and discussions on the issue of the non-emptiness of terms itself.

After answering how the issues under question were debated throughout history, part two is devoted to proposing new answers by formal analysis of syllogistic. Thus, it consists of demonstrating what additional existential assumptions need to be adopted in order for all 24 classically recognized syllogistic moods to be considered provable, both within the framework of modern formal logic and within the internal framework of syllogistic itself. To this end, first, a framework of modern formal logic, first order predicate calculus in particular, is employed, and the syllogistic moods are divided into several categories, based on the necessity of adopting additional existential premises in their proofs; next, a method of recognizing all the alternative direct and indirect proof cases within the framework of syllogistic itself is developed, and the computed proofs are arranged on several different sets of tables, from which conclusions pertaining to the mutual behaviors between the syllogistic moods are drawn. Through an analysis of all the alternative proofs displayed in the tables, the syllogisms are grouped into four different categories, differing from the usually recognized syllogistic figures; moreover, different sets of minimal inference rules sufficient to prove the whole system of syllogistic, different from the usual Aristotelian set, are proposed. Next, the necessity of adopting the

additional ontological assumptions is traced back to the fundamental syllogistic relations of subalternation and conversion with limitation, and the framework of additional mnemonic names developed by Leibniz and covered in the first part of the dissertation is used to better understand spotted regularities.

The final part of the thesis aims to address the previously discussed issues using the latest available tools, namely the interactive proof assistants, and particularly Isabelle/HOL. Relying on the formalization of Aristotle's syllogistic carried out using this assistant, all alternative direct proofs of the 24 valid syllogistic modes are carried out, and then it is examined whether the proofs formalized in this way rely on the same additional existential premises as those identified earlier. Finally, all the conclusions are collected together and connected with contemporary debate in philosophy of logic, most importantly to the debates about the nature and significance of the transition between Aristotelian syllogistic and modern formal logic.